

SEMIANNUAL REPORT
(January 1, 1971 - June 30, 1971)

OF

MULTIDISCIPLINARY RESEARCH GRANT
(NGR 43-001-021)

FACILITY FORM 602	<u>N71-73485</u> (ACCESSION NUMBER)	(THRU)
	<u>40</u> (PAGES)	<u>None</u> (CODE)
	<u>CR-118716</u> (NASA CR OR TMX OR AD NUMBER)	(CATEGORY)

Submitted to
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D. C.

by

The University of Tennessee
Knoxville, Tennessee 37916



W. A. Goodwin
W. A. Goodwin
Associate Dean for Research
Chairman, UT/NASA Committee
Date JUN 4 1971

Hilton A. Smith
Hilton A. Smith
Vice Chancellor for Graduate
Studies and Research
Date JUN 4 1971

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FOREWORD

This report consists of the Science Information Exchange Abstract forms for those projects that were active during the period January 1, 1970, through December 31, 1970. The information on the forms portrays the status and progress of the research in a brief concise manner. During the period there were twelve active projects in five broad problem areas. Ten of these projects have now been completed and final reports submitted for review and dissemination.

Future activities will involve the engagement of faculty members in the area of applying space technology to studying earth resources. To this end, new projects will be selected and authorized to begin about July 1, 1971.

INTRODUCTION

The twelve projects that were active during the period of this report are tabulated in Table I. They reflect work in five broad problem areas of investigation. They range from Dr. Schweitzer's work in photo-electron spectroscopy to the ecology program of Dr. Tanner's project. Ten of these twelve projects have been completed and final reports are being assembled for review and dissemination.

During the course of the research nineteen (19) faculty were directly supported along with at least eighteen (18) students at both undergraduate and graduate levels. As a result of the research, sixteen (16) publications have been generated to date. In a number of instances the projects have led to the submission of proposals to other agencies for support. For example, the work of Dr. Oliver led to a proposal and funding from the National Science Foundation. The project conducted by Dr. Neff provided background information for the University's proposal to the ERTS program. The research funds from the NASA Multidisciplinary Grant have been effective in developing research areas that have a potential for continuation. The funds that have been earmarked for administration of the program have been kept to a minimum in order that the maximum amount may be available for research.

The project reports have been grouped into their relevant problem areas and are presented under these problem areas in the following pages.

T A B L E I1970 NASA PROJECTS

<u>UT Acct. No.</u>	<u>Title</u>	<u>Principal Investigator and Department</u>
141024-3253R	"Photoelectron Spectroscopy"	G. K. Schweitzer Department of Chemistry
141060-3250R	"Development of an Analysis System for Vibration-Rotation Spectra and the Study of Accidental Resonances in Molecules of C _{3v} Symmetry"	W. E. Blass Department of Physics
141080-3254R	"Development Grant - Ecology Program"	J. T. Tanner Graduate Program in Ecology
141320-3255R	"Ultra High Purity Transition Metals and Alloys"	B. F. Oliver Department of Chemical and Metallurgical Engineering
141340-3128R	"A Feasibility System to Simulate a Data Collection Platform for the ERTS Program"	H. P. Neff, Jr. Department of Electrical Engineering
141370-3259R	"Mathematical Analysis of Biological Phe- nomena and Dynamic Ekistics"	A. H. Eraslan Engineering Mechanics
141490-3251R	"The Socio-Economic Impact of Science and Technology"	A. B. Biscoe, Jr.
142510-3142R	"NASA Contingency Fund"	W. A. Goodwin Graduate School
142510-3169R	"NASA Administration Fund"	W. A. Goodwin Graduate School
142610-3145R	"Application of Remote Sensors to Urban/ Regional Planning"	J. M. Prochaska Graduate School of Planning
545630-3161R	"Performance Tests of an X-ray Bone Densi- tometer"	R. E. Beauchene Department of Nutrition
844001-3126R	"Noise Suppression Aircraft of Transpor- tation Systems"	R. A. Kroeger Space Institute

<u>UT Acct.</u> <u>Nb.</u>	<u>Title</u>	<u>Principal Investigator</u> <u>and Department</u>
844001-3127R	"Use of Remote Sensing Techniques in Evaluating Earth Resources"	Firouz Shahrokhi Space Institute
844001-3252R	"Gas Dynamics and Interactions Between Materials and Gas Flows at High Speeds and High Temperatures"	Walter Frost Space Institute

PROBLEM AREA
ON
DYNAMIC EKISTICS

NO. 1 FOR PUBLICATION OR
PUBLICATION REFERENCE

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION
NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION
Office of University Affairs
Sustaining University Program

SIE NO.

4

AGENCY NO.

SUPPORTING AGENCY:

TITLE OF PROJECT:

"Mathematical Analysis of Biological Phenomena and Dynamic Ekistics"

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. Arsev H. Eraslan, Associate Professor of Engineering Mechanics

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

A. Analysis of Urban Populations:

1. Extensive literature survey of the available demographic studies (1970 census excluded) was completed. The essential data for the verification of the proposed theory was identified and separated from the general population data.
2. The potential form model for the migration between communities was applied to the interaction between the overall USA and the particular communities, on state and metropolitan area levels, based on per capita yearly income of the residents. It was clearly verified that the proposed migratory law was considerably more realistic and accurate in general application than the previously employed gravity models for predicting the migration rates.
3. The general mathematical theory was extended and modified as a paper "A Mathematical Model for Dynamic Ekistics" and it was presented at 8th Annual Meeting, Society of Engineering Science, Environmental Engineering, Washington, D.C., November 1970. The paper was also requested for possible inclusion in "Selected and Annotated Bibliography of Ecology and Biology, International Development, A Guide to Literature (copy of paper enclosed).
4. A new unsolicited research proposal was prepared for separate funding of the program.

B. Analysis of Biological Populations:

1. Moderate literature survey of the available experimental studies of biological population growth problems was accomplished. Certain valuable data for the verification of the general theory was identified and separated. It was found that the majority of experimental data was insufficient in clearly describing the environmental conditions during the experiments.
2. A detailed study for both experimental and theoretical analysis of two species

NOTICE OF RESEARCH PROJECT
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SIE NO.

5

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT:

"Mathematical Analysis of Biological Phenomena and Dynamic Ekistics"

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. Arsev H. Eraslan, Associate Professor of Engineering Mechanics

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

of Daphnia populations was initiated as a master thesis for a graduate student in Ecology.

3. The preliminary, local, time dependent solutions of the proposed theory was verified for the available population growth rates of the two aforementioned species based on previous studies.

4. The preparation of a monogram "Mathematical Field Theory for Biological Populations" was initiated and partially completed for publication according to the recommendations of the editor of Bulletin of Mathematical Biophysics.

SIGNATURE OF
PRINCIPAL INVESTIGATOR

Arsev H. Eraslan

PROFESSIONAL SCHOOL
(medical, graduate, etc.)

Engineering Mechanics

FUNDS DURING PERIOD REPORTED*

Faculty	\$3,843.99
Students	---
Other	156.01
Total	\$4,000.00

*include overhead

NUMBER OF

Faculty	1
Students	0
Publications	2

PERIOD OF AUTHORIZATION

Date Initiated: 4-1-70

Completion Date: 8-31-70

PROBLEM AREA
ON
EARTH RESOURCES

MAR 3 1971

SIE- 3A1 REV. 6-64

NOTICE OF RESEARCH PROJECT
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NATIONAL AERONAUTICS AND SPACE
ADMINISTRATIONOffice of University Affairs
Sustaining University ProgramNOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SIE NO.

6

AGENCY NO.

SUPPORTING AGENCY:

TITLE OF PROJECT:

Application of Remote Sensors to Urban/Regional Planning

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Joseph M. Prochaska, Principal Investigator
James T. Haddox, Research Associate

NAME AND ADDRESS OF INSTITUTION:

University of Tennessee, Graduate School of Planning, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

The original scope of work defined included a series of feasibility studies on the application of remote sensing to various aspects of the urban and regional environments including land use, transportation and environmental change. Additionally, efforts carried out within the grant also were aimed at developing additional support from outside the University to sponsor interdisciplinary research in remote sensing. The former tasks were completed and employed as the base for developing interests within various departments at the University of Tennessee in addition to providing directions for soliciting funds from Federal agencies other than NASA. In support of the latter task, that of developing interest within the various departments of the University, funds from the NASA-SUP were used to provide photographic support for those departments which had expressed an interest in an interdisciplinary approach to the use of remote sensing as a data gathering tool. In the final year of the grant, the total amount available was used exclusively for this purpose in the form of a salary for a photographic technician and attendant support services. The success of this approach can be measured in many ways, not the least of which is a grant under Project THEMIS from the Department of Defense in the amount of \$800,000.00 for the specific purpose of developing a center of excellence at the University of Tennessee in the interdisciplinary applications of remote sensing to the environment.

SIGNATURE OF
PRINCIPAL INVESTIGATORPROFESSIONAL SCHOOL
(medical, graduate, etc.)

Graduate School of Planning

FUNDS DURING PERIOD REPORTED*

Faculty	\$3,511.20
Students	---
Other	2,699.80
Total	\$6,211.00

*include overhead

NUMBER OF

Faculty	1
Students	0
Publications	1

PERIOD OF AUTHORIZATION

Date Initiated:	1/1/70
Completion Date:	12/31/70

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

NOTICE OF RESEARCH PROJECT
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ADMINISTRATION
Office of University Affairs
Sustaining University Program

SIE NO.

7

AGENCY NO.

SUPPORTING AGENCY:

TITLE OF PROJECT:

A FEASIBILITY SYSTEM TO SIMULATE A DATA COLLECTION PLATFORM
for the ERTS Program

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Herbert P. NEFF, Associate Professor of Electrical Engineering

NAME AND ADDRESS OF INSTITUTION:

The UNIVERSITY OF TENNESSEE, Knoxville, Tennessee 37916.

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

A data collection system consisting of a transmitting antenna, a 5 watt-401.9 MHz transmitter and a suitable modulator is to be designed, built and tested. The function of this data collection system is to take scientific data from some remote point, process this data, and transmit this data to another remote point. Due to the small amount of funds, no students can be supported by this project.

SIGNATURE OF
PRINCIPAL INVESTIGATORPROFESSIONAL SCHOOL
(medical, graduate, etc.)

Electrical Engineering

FUNDS DURING PERIOD REPORTED*

Faculty \$2,464
Students ---
Other 536
Total \$3,000

*include overhead

NUMBER OF

Faculty One
Students
Publications

PERIOD OF AUTHORIZATION

Date Initiated: 9/15/70
Completion Date: 12/31/70

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE

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NATIONAL AERONAUTICS AND SPACE
ADMINISTRATIONOffice of University Affairs
Sustaining University Program

SIE NO.

8

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT:

Noise Suppression Aircraft of Transportation Systems

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. Richard A. Kroeger, Principal Investigator

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee Space Institute
Tullahoma, Tennessee 37388

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

This report updates this project through Dec. 31, 1970. The mobile aeroacoustic laboratory was completed. The 7-ft. parabolic reflector was obtained, the focal point established and an acoustical calibration was made. The mobile laboratory was brought to a nearby glider field and noise measurements were made for various combinations of glider altitude and speed. Cameras were used to obtain the altitude and position of the glider during the tests. The data obtained were then spectrally analyzed to determine the sources of noise on a "clean" aircraft. A problem arose in reducing the data since the time duration of the recorded signal was so short. A high speed tape recorder and a loop playback spectrum analyzer were obtained to make short duration measurements possible. Further experience was gained by making very low level short duration noise measurements in a reverberation chamber. The system is now available for acoustic measurements of durations as low as 0.2 seconds.

SIGNATURE OF
PRINCIPAL INVESTIGATOR

R. A. Kroeger

PROFESSIONAL SCHOOL
(medical, graduate, etc.)

Univ. of Tenn. Space Institute

FUNDS DURING PERIOD REPORTED

NUMBER OF

PERIOD OF AUTHORIZATION

Faculty \$ 4,200
Students 4,896
Other 1,044
Total \$10,140

Faculty 1
Students 1
Publications

Date Initiated: 1/1/1970

Completion Date: 12/31/1970

*include overhead

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9

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION

SUPPORTING AGENCY:

Office of University Affairs
Sustaining University Program

TITLE OF PROJECT:

Use of Remote Sensing Techniques in Evaluating Earth Resources

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project

Dr. F. Shahrokhi, Principal Investigator, Associate Professor of
Aerospace Engineering

Dr. W. Frost, Co-Investigator, Associate Professor of Mechanical
Engineering

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee Space Institute
Tullahoma, Tennessee 37388

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

The program has been undertaken to locate existing and planned techniques for remote sensing of earth resources, and to relate these to the needs of Tennessee Valley Authority region. Remote sensing for natural resources from satellites or aircraft will benefit the nation in many ways. Sensors of different types, operating in different bands of the electromagnetic spectrum, yield many kinds of information while sensor - equipped satellites or aircraft allow continuous monitoring of a multitude of resources. The expected scientific and economic benefits resulting from remote sensing activities include:

- 1) Complete and periodic assessment of agricultural, forestry, and water resources.
- 2) Comprehensive and frequent land-use surveying for land-use planning groups.
- 3) Accurate and timely observation of man-made environmental changes and their consequences.
- 4) Rapid detection and mapping of air and water pollution types, sources, and extent of pollution.

SIGNATURE OF
PRINCIPAL INVESTIGATOR

F. Shahrokhi
F. Shahrokhi

PROFESSIONAL SCHOOL
(medical, graduate, etc.)

The University of Tenn., Space Ins

FUNDS DURING PERIOD REPORTED*

Faculty \$ 5,610
Students 1,440
Other 3,326
Total \$10,376

*include overhead

NUMBER OF

Faculty 2

Students 1

Publications Final Report in Draft Form.

PERIOD OF AUTHORIZATION

Date Initiated: 7-15-70

Completion Date: 1-31-71

PROBLEM AREA

ON

ECOLOGY

NOT FOR PUBLICATION OR
PUBLICATION REFERENCENOTICE OF RESEARCH PROJECT
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ADMINISTRATION

SIE NO.

10

AGENCY NO.

SUPPORTING AGENCY:

Office of University Affairs
Sustaining University Program

TITLE OF PROJECT:

Graduate Program in Ecology

Give names, departments, and official title of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project

J. T. Tanner, Director, Graduate Program in Ecology
 E. E. C. Clebsch, Associate Professor of Botany
 H. Fribourg, Professor of Agronomy
 D. E. Reichle, Lecturer in Zoology

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

There are four research projects in ecology supported by this UT/NASA project. They are

1. Chemical inhibition of sassafras trees on other species of plants; Professor in charge, Dr. Clebsch; Master's thesis almost completed as a result of this research; no publications as yet on this project.
2. A distribution of earthworm species as affected by soil types in the Tennessee valley; Professor in charge, Dr. Clebsch; doctoral dissertation research entering first phase of field studies; no publications as yet on this subject.
3. Measurement of the success of stand establishment of pasture legumes as affected by the time of planting; Professor in charge, Dr. Henry Bribourg; no publications as yet.
4. Relations between the feeding habits and rates of soil invertebrates in the cycling of minerals; Professor in charge, Dr. David Reichle, (ORNL); publications - see the following two citations:

Annual Reports

McBrayer, J. F., et al, 1971. "Feeding Rates of Soil Microinvertebrates," Ecological Sciences Division Annual Program Representative, pp. 33-34, Oak Ridge National Laboratory, 1970.

NOTICE OF RESEARCH PROJECT
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ADMINISTRATION
Office of University Affairs
Sustaining University Program

SIE NO.

11

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT:

Graduate Program in Ecology

Give names, department and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

J. T. Tanner, Director, Graduate Program in Ecology
E. E. C. Clebsch, Associate Professor of Botany
H. Fribourg, Professor of Agronomy
D. E. Reichle, Lecturer in Zoology

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government or private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

Annual Reports (Cont.)

Reichle, D. E., et al. 1971. "Seasonal Distribution of Earthworm Numbers, Biomass, and ¹³⁷Cs Body Burdens in the Tagged Liriodendron Forest," Ecological Sciences Division Annual Program Representative, pp. 30-32, Oak Ridge National Laboratory, 1970.

Abstracts

McBrayer, J. F. 1971. "Radiotracer Analysis of Feeding by Soil Invertebrates," Associated Southeastern Biologists. (Meeting April 15-17, 1971)

McBrayer, J. F. 1971. "The Role of Coprophagy in the Nutrition of a Leaf-litter Feeding Millipede, Apheloria montana (Bollman)," AIBS (Meeting August 29 - September 3, 1971).

Reichle, D. E., et al. 1971. "The Impact of Earthworms on the Uptake, Turnover, and Distribution of Cesium-137 in Liriodendron Forest Soil," Third National Symposium on Radioecology. (May 10 - 12, 1971)

Publications

McBrayer, J. F., and D. E. Reichle. 1971. Trophic Structure and Feeding Rates of Forest Soil Invertebrate Populations, Oikos (in press).

SIGNATURE OF
PRINCIPAL INVESTIGATOR*James T. Tanner*PROFESSIONAL SCHOOL Graduate Program in Ecology U.T.
(medical, graduate, etc.)FUNDS DURING PERIOD REPORTED*

Faculty \$ ---
Students 21,720
Other 8,080
Total \$29,800

*include overhead

NUMBER OF

Faculty 0
Students 4
Publications 2

PERIOD OF AUTHORIZATION

Date Initiated: 7/1/70
Completion Date: 6/30/71

PROBLEM AREA

ON

GAS DYNAMICS

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE

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NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION

SIE NO.

12

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

Office of University Affairs
Sustaining University ProgramTITLE OF PROJECT: Gas Dynamics and Interaction Between Materials and
Gas Flows at High Speeds and High Temperatures.

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project

Dr. Walter Frost, Principal Investigator

NAME AND ADDRESS OF INSTITUTION: The University of Tennessee Space Institute
Tullahoma, Tennessee 37388

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

The study of gas dynamics and interaction between materials and gas flows at high speeds and high temperature is proceeding in the three areas of porous plate cooling, boron fiber composites testing and radiation interaction.

Porous Plate Cooling

An experimental investigation of one-dimensional two-phase flow transpiration cooling through porous metal samples is in progress. The measured data are compared to calculated results, for a steady state homogeneous analytical model. The comparison shows good agreement for the temperature distribution through the porous plate and the heat flux at the exit surface, as long as the basic assumptions of the analytic model are satisfied. Deviations from the basic assumptions are caused by nonhomogeneous and unstable flow conditions and by a thermodynamic nonequilibrium mixture? A nondimensional parameter is derived, whose value seems to be indicative of the flow condition to be expected, and a modified analytical model permits also calculations for the case where a nonequilibrium mixture occurs. Measured and calculated pressure drop across the porous plate shows a contradicting trend, which can be attributed to capillary forces active in the minute flow channels of the porous material.

NOTICE OF RESEARCH PROJECT
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NATIONAL AERONAUTICS AND SPACE
ADMINISTRATIONOffice of University Affairs
Sustaining University Program

SIE NO.

13

AGENCY NO.

NO. 1 FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT: Gas Dynamics and Interaction Between Materials and
Gas Flows at High Speeds and High Temperatures.

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project

Dr. Walter Frost, Principal Investigator

NAME AND ADDRESS OF INSTITUTION: The University of Tennessee Space Institute
Tullahoma, Tennessee 37388

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

(page 2)

Boron Fiber Composites

An experimental investigation has been carried out to evaluate the static and the dynamic properties of aluminum reinforced with boron filaments. The elastic modulus, tensile strength, and fatigue life were obtained at various elevated temperatures using specimens reinforced with 20 v/o and 50 v/o boron filaments.

It was concluded that the tensile strength at all temperatures could best be described by an upper bound and a lower bound. The individual values obtained experimentally depended sensitively on the mean strength of the fibers, the deviation of the fiber strengths, and the ability of the matrix to transfer stress around fiber breaks. All of these factors were affected by the techniques used to fabricate the specimens.

The properties of most specimens were decreased at elevated temperatures; however, recovery occurred on cooling to room temperature. Exposure to very high temperatures for extended periods of time resulted in the permanent degradation of all properties. The observed results are explained in terms of the variation in the properties of the constituent phases.

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE

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ADMINISTRATIONOffice of University Affairs
Sustaining University Program

SIE NO.

14

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT: Gas Dynamics and Interaction Between Materials and
Gas Flows at High Speed and High Temperatures.

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. Walter Frost, Principal Investigator

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee Space Institute
Tullahoma, Tennessee 37388SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)
(page 3)Radiation Interaction

The research effort has been an analysis and interpretation of backscatter measurements and their relation to the mass concentration and size distribution of particulate in boundary layer.

Analytically investigated are relative intensities of backscattering from MIE and Rayleigh size particles of different materials. Particle sizes ranged from .025 microns to 1 micron and incident beam wavelengths from .6 microns to 4 microns. Also, investigated relative intensity vs number density for the two categories of particle sizes to determine whether a small concentration of Rayleigh scatterers could be detected in a field of MIE scatterers of varying concentrations.

SIGNATURE OF
PRINCIPAL INVESTIGATOR

Walter Frost

PROFESSIONAL SCHOOL
(medical, graduate, etc.)

The Univ. of Tenn. Space Inst.

FUNDS DURING PERIOD REPORTED*

Faculty \$15,600
Students 17,059
Other 7,603
Total \$40,262

*include overhead

NUMBER OF

Faculty 3
Students 2 Ph.D.
1 Master
Publications None

PERIOD OF AUTHORIZATION

Date Initiated: 1-1-70

Completion Date: 12-31-70

PROBLEM AREA

ON

MANAGEMENT OF SCIENCE

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION
NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION

SIC NO.

15

AGENCY NO.

NO. FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

Office of University Affairs
Sustaining University Program

TITLE OF PROJECT:

The Socio-Economic Impact of Science and Technology

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Alvin B. Biscoe, Vice President for Inst. Research, Project Director; and principal investigators Ben B. Barnes, Associate Prof. of Elec. Engineering; W.A. Goodwin, Associate Dean, the Graduate School; Jack E. Holmes, Professor of Political Science; Hans E. Jensen Professor of Economics; and Charles W. Keenan, Professor of Chemistry.

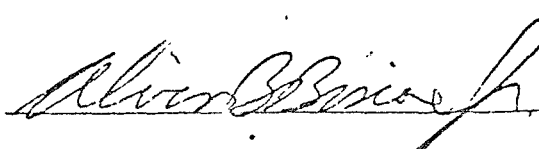
NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville 37916

SUMMARY OF PROPOSED WORK - (200 words or less) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research. Summaries are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

A speaker series to bring to the campus as speakers and consultants a few outstanding professional or academic researchers who have been investigating the interaction of governmental policy and science and technology. First to appear as speaker and critic is professor Theodore J. Lowi, Professor of Political Science, University of Chicago. In addition to making a prepared speech Mr. Lowi also acted as a critic and consultant for half a day for the Tennessee Science and Technology Study sponsored by NSF and NASA.

SIGNATURE OF
PRINCIPAL INVESTIGATOR



PROFESSIONAL SCHOOL
(medical, graduate, etc.) College of Business Administration

FUNDS DURING PERIOD REPORTED*		NUMBER OF	PERIOD OF AUTHORIZATION
Faculty	--	Faculty	Date Initiated: 1/1/70
Students	--		
Other	\$6,000.00 (speakers)	Students	Completion Date: 12/31/70
Total	\$6,000.00	Publications	1

*include overhead

PROBLEM AREA
ON
PHOTOELECTRON SPECTROSCOPY AND MATERIALS SCIENCES

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION
NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION

SIE NO.

16

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

Office of University Affairs
Sustaining University Program

TITLE OF PROJECT:

Photoelectron Spectroscopy

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. George K. Schweitzer, Professor of Chemistry
Mr. John D. Allen, Research Associate in Chemistry
Research Assistant in Chemistry to be selected

NAME AND ADDRESS OF INSTITUTION:

University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

In our laboratories, with the assistance of some NSF funds in addition to the NASA funds, we have completed an electrostatic double cylindrical photoelectron spectrometer. It has been equipped with a rare gas discharge source, an X-ray source, a multi-channel data analyzer and a print-out and strip chart recorder.

Using our new instrument and the previously existing instrument at Oak Ridge, we have carried out photoelectron spectral measurements on 22 carefully selected small molecules, 4 ionic-lattice substances, 11 coordination compounds, and 3 organic molecules. The results have been or are in the process of being analyzed, written up and published.

Using the data from our photoelectron spectral analyses we have also been setting up programs for quantum chemical calculations and correlations. These theoretical approaches are giving us previously-unavailable insights into the characteristics of a number of species we have studied.

The above measurements and calculations will be continued during the period January 1 through December 31, 1971. Special attention will be paid to the sample chamber of the photoelectron spectrometer to permit it to handle materials at very low and very high temperatures. In addition to the type of measurements mentioned above, compounds requiring these high and low temperature facilities will be investigated.

SIGNATURE OF
PRINCIPAL INVESTIGATORPROFESSIONAL SCHOOL
(medical, graduate, etc.)

Chemistry

FUNDS DURING PERIOD REPORTED*

NUMBER OF

PERIOD OF AUTHORIZATION

Faculty \$ 4,200
Students 8,820
Other 780
Total \$12,000

Faculty 1
Students 2
Publications 3

Date Initiated: Jan. 1, 1971
Completion Date: Dec. 31, 1971

*include overhead

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION
NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION
Office of University Affairs
Sustaining University Program

SIE NO.

17

AGENCY NO.

MAR 6 1971

NO. 1 FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT:

Development of an Analysis System for Vibration-Rotation Spectra and the Study of Accidental Resonances in Molecules of C_{2v} Symmetry.

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Principal Investigator: W. E. Blass, Assistant Professor of Physics and Astronomy

Research Worker: Haydee Kurlat, Research Associate

Donald Jennings, Research Assistant

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee
Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

The goal of the project is the development of a complete algorithmic computer assisted analysis system for vibration-rotation spectra of axially symmetric molecule.

The purpose is twofold--both to achieve the completion of a useable analysis system and also to development computer-oriented systems in an area of physics which has achieved a high level of sophistication complexity. A second aspect of the project involves the application of time series methods, including predictive filtering, to the processing of complex digitally recorded astronomical and laboratory spectra.

The analysis system has been completed for use in a batch processing environment. Current effort is involved in implementing much of the software in a real time acquisition and control system using a PDP-11 computer. The digital filtering studies are in progress and results to date indicate possible direct benefit to the high resolution spectroscopist.

Support provided:

Faculty 1	2 man months
Res. Assoc. 1	3 man months
Grad. Student 1	4-1/2 man months

Publications:

4 papers presented at 1970 Symposium on Molecular Structure and Spectroscopy, Ohio State University.
4 journal articles, in press.

SIGNATURE OF
PRINCIPAL INVESTIGATORPROFESSIONAL SCHOOL
(medical, graduate, etc.)

Physics

FUNDS DURING PERIOD REPORTED*

NUMBER OF

PERIOD OF AUTHORIZATION

Faculty	\$5,328
Students	1,660
Other	1,012
Total	\$8,000

Faculty	1
Students	2
Publications	8

Date Initiated: 1/1/70

Completion Date: 12/31/70

*include overhead

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE

SHITNEORIAN INSTITUTION

NATIONAL AERONAUTICS AND SPACE
ADMINISTRATIONOffice of University Affairs
Sustaining University Program

SIL NO.

18

AGENCY NO.

NO. FOR PUBLICATION OR
PUBLICATION REFERENCE

SUSTAINING AGENCY:

NAME OF PROJECT:

Performance Tests of an X-ray Bone Densitometer

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Roy E. Beauchene, Ph.D., Associate Professor, Nutrition
 Rossie L. Mason, M. S., Assistant Professor, Nutrition
 Kathleen Newell, M. S., Graduate Assistant, working on Ph.D. in Nutrition

NAME AND ADDRESS OF INSTITUTION:

University of Tennessee

Knoxville, Tennessee 37996

SUMMARY OF PROPOSED WORK - (2-3 paragraphs or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

Performance tests of an instrument designed to determine bone density without the use of film by directly relating the absorption of X-ray energy by bone to an aluminum-zinc alloy wedge used as a standard are continuing.

Linearity of the absorption curve through 0.106 inches of wedge thickness has been maintained. The instrument continues to function well in the field after transportation in a University van. Service requirements on the instrument have not been unusual.

Determination of the bone densities of the 5-2 phalanges of small children have been greatly improved by a positioning stand especially designed for them. Satisfactory tracings have been obtained on 50 children with the new stand.

Work is continuing on improving the precision and accuracy with which bone density measurements can be made. Variables are being studied using aluminum rods, synthetic bone, and the bone of experimental animals. The bone density of the caudal vertebra of the rat has been found to be significantly correlated to its ash content. Unknown variables are causing difficulty in obtaining significant correlations between the bone densities of the rat tibias and their ash content. Three students have been supported in part by this project.

SIGNATURE OF
PRINCIPAL INVESTIGATORPROFESSIONAL SCHOOL
(medical, graduate, etc.)

Agricultural Experiment Station

FUNDS DURING PERIOD REPORTED	NUMBER OF	PERIOD OF AUTHORIZATION
Faculty \$ ---	Faculty 2	Date Initiated: January 1, 1
Students 1,800	Students 3	Completion Date: July 1, 1970
Other 1,950		
Total \$3,750	Publications	

*Include overhead

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE

SMITHSONIAN INSTITUTION

NATIONAL AERONAUTICS AND SPACE
ADMINISTRATIONOffice of University Affairs
Sustaining University Program

SIE NO.

19

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT:

Ultra High Purity Transition Metals & Alloys

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. Ben F. Oliver, Professor of Metallurgical Engineering

NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

The Ultra High Purity Metals laboratory initially started by a NASA equipment grant has developed to the point where full-scale research operations are now being initiated with one M. S. graduate student and two senior students. This laboratory development may be made current by discussing facilities, funding, personnel, and research subjects.

- I. Facilities: The laboratory is now complete with the zone scanner capable of processing one-inch diameter bars twelve inches long in oxidizing, reducing, or in inert atmosphere as well as high vacuums. Added facilities--one new 30kw motor generator set for zone scanner, one vacuum system and gauges, one completed installation of all related equipment with debugging of the scanner nearly complete, one additional output station 30kw, 10khz for auxiliary operations to the scanner, one thermal gradient solidification furnace.
- II. Funding: This laboratory has now been funded for two years (\$64,000) by the National Science Foundation for "Development of High Purity Transition Metals and Alloys."
- III. Personnel: One M. S. student--Thesis on Ultra High Purity Nickel--vacant--ultra high purity cobalt problem; two seniors--one working toward a senior thesis on Coupled Growth of Composite Structures through Solidification and one working on ion exchange prepreparation for iron and assisting on the nickel problem.

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE

SMITHSONIAN INSTITUTION

NATIONAL AERONAUTICS AND SPACE
ADMINISTRATIONOffice of University Affairs
Sustaining University Program

SIE NO.

20

AGENCY NO.

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

SUPPORTING AGENCY:

TITLE OF PROJECT:

Ultra High Purity Transition Metals & Alloys

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

Dr. Ben F. Oliver, Professor of Metallurgical Engineering


NAME AND ADDRESS OF INSTITUTION:

The University of Tennessee, Knoxville, Tennessee 37916

SUMMARY OF PROPOSED WORK - (200 words or less.) - In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes. (Please indicate the number of students supported by this project.)

Oliver's project (Cont'd)

IV. Research Subjects: The research subjects are listed above in Item III and are currently active. The work on nickel is now organized and looks very promising.

SIGNATURE OF
PRINCIPAL INVESTIGATORPROFESSIONAL SCHOOL
(medical, graduate, etc.)Ben F. Oliver
Chemical and Metallurgical
EngineeringFUNDS DURING PERIOD REPORTED*NUMBER OFPERIOD OF AUTHORIZATION

Faculty \$ ---
Students ---
Other 20,000 (Equipment)
Total \$20,000

Faculty 1
Students 3
Publications 0

Date Initiated: 1/1/70
Completion Date: 12/31/70

FUTURE ACTIVITIES

An attempt was made during the Program year to define faculty interests and capabilities in the use of remote sensing techniques in evaluating earth resources. The results of this study indirectly led to an announcement for receipt of proposals. This announcement, Appendix A-1, was directed to the total University faculty and has generated considerable interest. Twenty-four proposals were received for evaluation. The projects will be selected at the Committee meeting on June 4, 1971. The range of subject matter included in the proposals may be inferred by the listing on page A-3. To aid in evaluating the proposals, a rating form was constructed and is included in this report as page A-4. The projects selected will be discussed in the next report on the Program.

The management of the Multidisciplinary Program continues to be made effective through the energies and interests of the UT/NASA Committee. This Committee meets at least quarterly to review progress and develop program areas. The membership of the Committee is shown on page A-7.

8

APPENDIX

THE UNIVERSITY OF TENNESSEE, KNOXVILLE
KNOXVILLE 37916OFFICE OF THE VICE CHANCELLOR FOR
GRADUATE STUDIES AND RESEARCH

203 ADMINISTRATION BUILDING

April 22, 1971

AREA 615
TELEPHONE: 974-3466

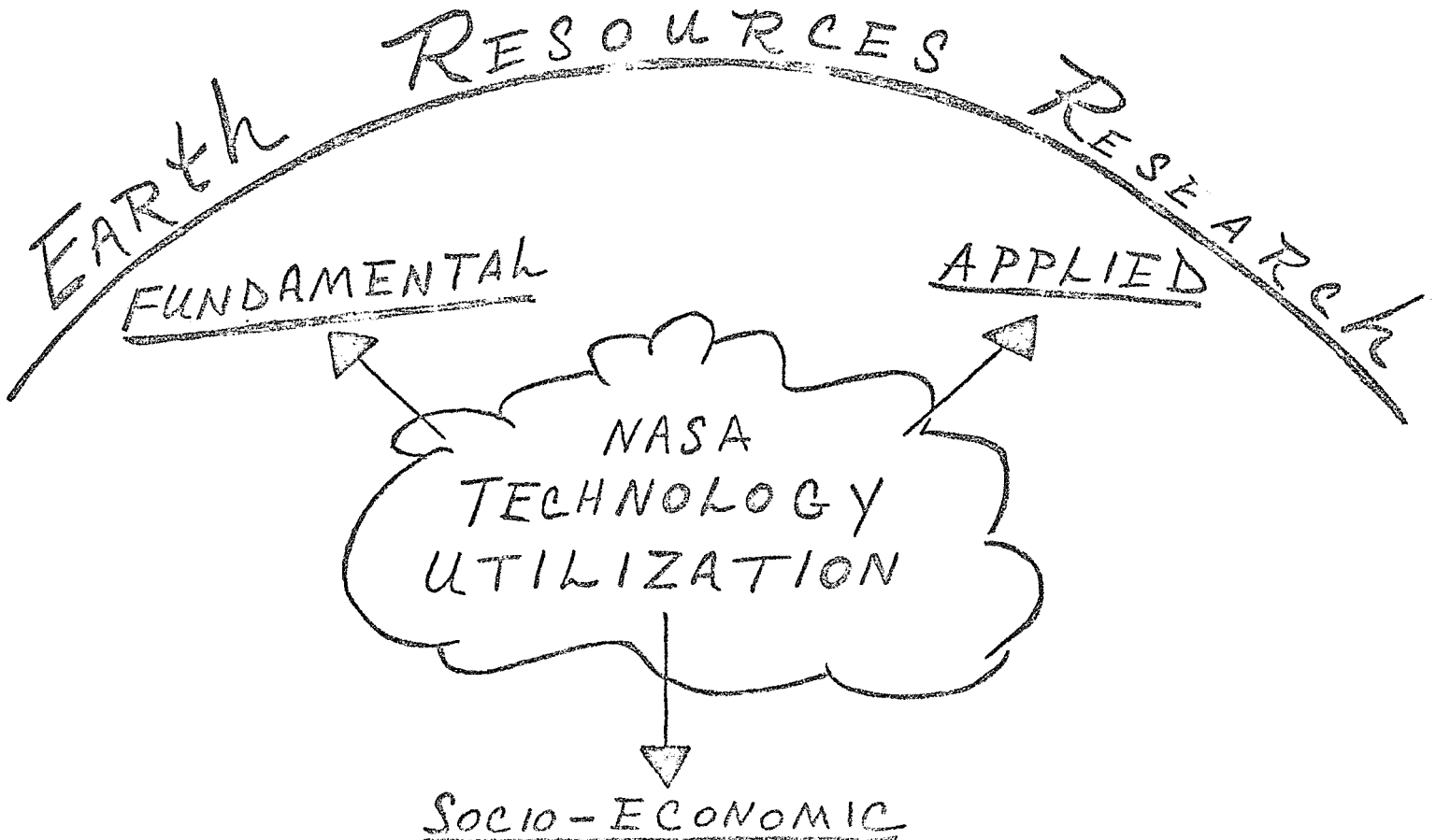
TO: Deans and Department Heads

FROM: W. A. Goodwin
Chairman of the UT/NASA Committee

SUBJECT: Request for Research Proposals - 1971 Funding

The UT/NASA Committee has recently been meeting to define research problem areas that are appropriate for funding under the NASA Sustaining University Program. As you may remember, NASA has phased out the program for future funding. However, there remains a limited amount of funds for commitment. In keeping with NASA's interest in applying space technology to studying earth resources, three areas of investigation have been defined.

They are



Memo to Deans and Department Heads

Page Two

April 22, 1971

Typical subjects in these areas of investigation are

- Air, Land, & Water Pollution
- Assessing Natural Disasters
- Biotic and Abiotic Degradation
- Chemistry of the Atmosphere
- Land Use
- Physics of the Atmosphere
- Urbanization

The proposals are due by 5:00 p.m. on May 31, 1971. They need not be lengthy but should include at least the following:

- Title Page
- Research Plan (suggest 2 or 3 pages)
- Personnel
- Itemized Budget
- Time Requirements

The review will be completed by June 15, and the projects awarded to begin July 1, 1971.

For your planning, it is anticipated that about \$40,000 (including overhead at 20 percent of total costs - including fringe benefits - exclusive only of equipment) will be allocated to each of the three areas. It is anticipated that no more than six proposals will be funded. Researchers are encouraged to develop interdisciplinary type proposals.

Please send 10 copies of the proposal to:

W. A. Goodwin
Associate Dean for Research
203 Administration Building
The University of Tennessee
Knoxville, Tennessee 37916

Phone: 974-3466

WAG:lfh

Enclosure - UT/NASA Committee Membership

cc: UT/NASA Committee
Dr. Hilton A. Smith

UT/NASA COMMITTEEProposal Submitted to Date May 31, 1971

on UT/NASA Request of April 22, 1971

<u>No.</u>	<u>Title</u>	<u>Principal Investigator and Department</u>	<u>Amount Requested*</u>
1	"Experimental Determination of Diffusion Coefficients of Interest in Environmental Air Pollution Problems" (<u>Revised Proposal No. 1A</u>)	W. J. Kooyman Chemical Engineering	12,000
2	"Proposal for an Infrared Spectrophotometer" (<u>Revised Proposal No. 2A</u>)	G. C. Frazier Chemical Engineering	26,000
3	"Effects of Atmospheric Aerosols on Scattering Reflected Visible Light from Earth Resources Features"	K. E. Noll Civil Engineering	28,140
4	"Design of a Laser Radar for Measurement of Atmospheric Aerosols"	T. V. Blalock Electrical Engineering	14,408
5	"Application of Pattern Recognition to the Analysis, Monitoring, and Classification of Environmental Data"	R. C. Gonzalez Electrical Engineering	14,933
6	"Research in Modern Power Engineering" (<u>Revised Proposal No. 6A</u>)	J. C. Hung Electrical Engineering	32,620
7	"Development of an Electrostatic Precipitation Laboratory for Air Pollution Control Research" (<u>Also Supplement No. 7A</u>)	M. O. Pace Electrical Engineering	17,182
8	"The Effects of Air Pollution on the Heat and Mass Transfer Mechanisms in Vegetation"	R. L. Reid Mechanical and Aerospace Engineering	30,308
9	"Development of Automated Dynamic Testing for Nuclear Power Systems"	T. W. Kerlin Nuclear Engineering	14,758
10	"Measurement of Low Level Background Radiation in East Tennessee" (<u>Revised Proposal No. 10A</u>)	H. G. MacPherson Nuclear Engineering	19,240
11	"Ideas"	Kenneth Fox Physics	

*Budget has been corrected.

Proposals Submitted to UT/NASA Committee (Cont'd)

<u>No.</u>	<u>Title</u>	<u>Principal Investigator and Department</u>	<u>Amount Requested*</u>
12	"Effects of 3,4-Benzpyrene on Cell Division, Cell Surface Activity, and Alteration of Nuclear Function in Protozoan and Tissue Culture Cells"	G. L. Whitson Zoology	26,100
13	"Application of a Mathematical Theory for Urban Population Dynamics"	Arsov H. Eraslan Engineering Mechanics	15,447
14	"Microbiological Contamination of Streams of the Great Smoky Mountains National Park Following the Invasion of the Wild Boar"	J. O. Mundt Microbiology	6,060
15	"Measuring and Minimizing the Social Cost of Environmental Pollution: A Case Study of the Economics of Waste Discharge, Waste Abatement, and Waste Control Policies"	C. B. Garrison Center for Business and Economic Research	37,993
16	"Ecosystem Dynamics of Old-Field Pine Succession in Knox County, Tennessee"	F. W. Woods Program in Ecology	20,080
17	"On-Line, Real-Time Computing Laboratory and Traineeship Program"	A. O. Bishop Electrical Engineering	47,010
18	"Initiating Research on Power Plant Siting"	W. T. Snyder Engineering Mechanics	52,326
19	"Distribution of Metals Among Organic and Inorganic Particulate Solids in Natural Waters"	R. M. Perhac Geology John Larsen Chemistry	4,360
20	"The Acquisition of A Composite Reflection Spectroradiometer"	J. D. Womack Civil Engineering	4,500
21	"Mitochondrial DNA Forms From Both Neoplastic Tissue and Transformed Tissue Cultures"	B. C. Kline Biochemistry J. H. Coggin Microbiology	12,000
22	"(3P) and (1D) Oxygen Atom Reactions With NO and NO ₂ "	F. Schmidt-Bleek Chemistry	5,426
23	"The Use of Remote Sensors as Regional Environmental Inventory Tools: Two Feasibility Studies"	J. M. Prochaska Graduate School of Planning	40,000

*Budget has been corrected.

Proposals Submitted to UT/NASA Committee (Cont'd)

<u>No.</u>	<u>Title</u>	<u>Principal Investigator and Department</u>	<u>Amount Requested*</u>
24	"High Resolution Raman and Infrared Spectra of NO ₂ and SO ₂ "	W. H. Fletcher Chemistry Kenneth Fox Physics and Astronomy	51,740

*Budget has been corrected.

6/1/71

UT/NASA COMMITTEE

Analysis Sheet for Preference Rating of Proposals

Proposal No. _____

Principal Investigator _____

Department _____

S C O R I N G R E C O R D

I. PROJECT MANAGEMENT

Principal Investigator(s)

1. Technical ability

a. Education

b. Experience

2. Past performance

a. Technical conduct of research

b. Project management

Unknown	Outstanding	Very Good	Good	Fair	Poor
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

II. RESEARCH PLAN

Concept of problem

Imagination/Innovation

Relevance/Priority to NASA

Multidisciplinary Approach

Scientific approach

Realistic and promising approach

1. Total checks in each column

2. Weight of each column

3. Column total times column weight

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
—	—	—	—	—
10	9	8	7	6
—	—	—	—	—

We will "calculate" the rating; however, you should indicate an overall numerical rating.

Your Rating _____

Calculated Rating _____

UT/NASA COMMITTEE MEMBERSHIP

<u>Name</u>	<u>Department</u>	<u>Address</u>	<u>Phone</u>
Mr. W. A. Goodwin Associate Dean for Research Chairman	Graduate School	203 Admin. Bldg.	3466
Dr. James C. Cotham Director of the Center for Business & Economic Research	Business Admin.	9 Glocker	5441
Dr. Walter Frost Assistant Professor	Space Institute Mechanical Engr.	The University of Tenn. (1) 455-0631 Space Institute Tullahoma, Tennessee 37388	
Dr. Norman M. Gailar Associate Professor	Physics	M4 Physics	2364
Dr. Alfred P. Levin Associate Professor	Bio-Chemistry	620 Hesler Bio. Bldg.	5148
Mr. W. Kenneth Stair Assistant Dean of Engr.	Engineering	124 Perkins	2570
Dr. E. E. Stansbury Professor	Chem. & Met. Engr.	435 Dougherty Hall	2420
Dr. T. Ffrancon Williams Professor	Chemistry	230 Buehler	3144